The application of SafeLM Video Laryngeal Mask in airway management during painless bronchoscopy

Abstract: With the widespread use of painless bronchoscopy in clinical practice, airway management has received increasing attention from anesthesiologists. The SafeLM Video Laryngeal Mask, as a high-comfort and low-stress airway management tool, meets the airway management requirements of painless bronchoscopy. Therefore, this article reviews the clinical advantages of the SafeLM Video Laryngeal Mask in bronchoscopy, aiming to provide a theoretical basis for the clinical application of the SafeLM Video Laryngeal Mask in bronchoscopy.

Keywords: Visualization, Bronchoscopy, Laryngeal mask

Introduction

Bronchoscopy, as an important diagnostic and therapeutic approach in the diagnostic process of respiratory and critical care medicine, plays a significant role in the diagnosis of tracheal, bronchial and pulmonary infections and neoplastic diseases, but its clinical application is limited by the high incidence of various serious adverse reactions and unbearable discomfort in patients during the examination invasion. In recent years, with the increasing demand for comfortable medical care, painless bronchoscopy has gradually replaced traditional bronchoscopy and is widely used in clinical practice.

Painless bronchoscopy diagnosis and treatment is based on traditional Fiberoptic bronchoscope (FB). Through the use of anesthetic drugs, patients are kept in a painless state during the examination process. At present, the common anesthesia management for painless fiberoptic bronchoscopy in clinical practice adopts the anesthesia method of sedative drugs to ensure that the patient is at an appropriate sedation level, so as to facilitate the smooth and safe completion of bronchoscopy diagnosis and treatment. However, although the application of painless fiberoptic bronchoscopy provides patients with a relatively comfortable diagnosis and treatment

method, it also has adverse reactions such as hypoxemia, respiratory depression, and tongue retraction, and airway management is rather difficult. Since fiberoptic bronchoscopy and anesthesia need to share one airway, airway obstruction and other situations may occur during the operation, making the surgery somewhat complex and special. However, the Laryngeal Mask (LM) can effectively solve the clinical problem of respiratory tract sharing. At the same time, LM has many clinical advantages such as high operational comfort, mild injury stimulation, stable hemodynamics, maintenance of available oxygen, and effective retention of airway patency. However, there are still potential airway management safety issues in the use of LM for airway management, such as incorrect blind probe insertion position, displacement leakage, reflux aspiration, and bleeding from pharyngeal injury. Studies have shown that in clinical practice, 50-80% of patients still have inaccurate laryngeal mask placement positions [1].

In recent years, with the continuous progress and transformation of anesthesia technology, laryngeal masks have added video functions on the basis of the original ventilation, achieving visualization of laryngeal masks. Compared with the traditional LM, the SafeLM Video Laryngeal Mask has the advantages of visual insertion, accurate positioning, less soft tissue injury of the throat, high Oropharyngeal Leak Pressure (OLP), and good sealing performance [2]. During the process of placing the laryngeal mask, the indwelling condition of the laryngeal mask placement can be observed under the full guidance of the video endoscope, ensuring the correct placement position of the laryngeal mask, reducing the risk of displacement and air leakage, and improving the safety of the laryngeal mask in airway management. At the same time, it is necessary to avoid complications such as laryngeal injury, bleeding, redness and swelling caused by improper insertion of the laryngeal mask, as well as laryngeal spasm and hemodynamic instability of patients caused by multiple blind insertion attempts, to improve the safety and comfort of the surgery and reduce the use of postoperative analgesic drugs [2, 3]. In addition, when the laryngeal mask shifts and leaks air, or when there is reflux and aspiration, the position of the SafeLM Video Laryngeal Mask can be adjusted under the video endoscope and negative

pressure aspiration can be performed, thus avoiding the occurrence of aspiration pneumonia. Therefore, this article reviews the clinical advantages of SafeLM Video Laryngeal Masks in bronchoscopy diagnosis and treatment, aiming to provide a theoretical basis for the clinical application of SafeLM Video Laryngeal Masks in bronchoscopy .

I. Increase the success rate of the first insertion of laryngeal masks and reduce postoperative complications

At present, blind insertion of laryngeal masks is mostly used in bronchoscopy diagnosis and treatment in clinical practice. However, studies have shown that 50-80% of patients still have inaccurate laryngeal mask insertion positions [1]. The SafeLM Video Laryngeal Mask can be inserted and adjusted under visual conditions, which eliminates the differences brought by the laryngeal mask insertion technique and avoids bleeding and redness in the throat caused by poor laryngeal mask positioning or repeated adjustment of the laryngeal mask position during the operation. Laryngeal hemorrhage after laryngeal mask removal is a common adverse event of supraglottic ventilation devices, with an incidence rate of approximately 0% to 50%[4-6]. Meanwhile, studies have also reported that 6% to 34% of patients who used laryngeal masks for airway management experienced sore throat after surgery [7, 8]. The occurrence of adverse events related to supraglottic ventilation devices such as pharyngeal bleeding and sore throat is associated with the blind insertion technique of laryngeal masks and the inability to observe the anatomical structure of the supraglottic pharynx and the fit of the laryngeal mask. During the blind insertion of the laryngeal mask, anesthesiologists, unable to observe the laryngeal mask, glottis and surrounding anatomical structures, can only indirectly assess whether there is air leakage through visual inspection of the rise and fall of the chest and abdomen and auscultation. If air leakage occurs, the anesthesiologist needs to repeatedly adjust the position of the laryngeal mask. During this process, it may cause damage to the epiglottis, arytenoid cartilage and oral soft tissues, resulting in pain and bleeding in

the throat after the operation. In addition, LM combined with flexible fiberoptic bronchus is also a major airway tool for bronchoscopy under general anesthesia in children [9]. However, considering the unique anatomical features of the pharynx of the child patient - including hypertrophy of the tongue body, a relatively high position of the larynx (approximately at the C3-4 level, while in adults it is at C5-6), and a relaxed and hypertrophic epiglottis that is U-shaped and forward-shifted, it may lead to difficulties in blind insertion of LM. Low implantation success rate and repeated adjustment of LMA may also cause complications such as glottic edema and mucosal damage in children with unique physiological and anatomical characteristics such as soft cartilage, vocal cord and pharyngeal mucosal tissue damage. The SafeLM Video Laryngeal Mask used in pediatric bronchoscopy diagnosis and treatment can provide real-time image feedback, enabling the operator to intuitively determine the position of the laryngeal mask and make immediate adjustments, which greatly improves the success rate of the first implantation. This technological breakthrough is particularly important for solving the special problems in children's airway management. Therefore, the SafeLM Video Laryngeal Mask can be inserted under visual conditions, which increases the success rate of the first insertion. At the same time, it avoids damage to tissues such as the epiglottis and arytenoid cartilage, reduces the occurrence of postoperative complications such as laryngeal bleeding and pain, and improves the postoperative comfort of patients.

Ⅱ. It can prevent the occurrence of intraoperative hypoxemia and is suitable for patients at high risk of hypoxemia

Clinically, the anesthesia methods for diagnostic bronchoscopy mostly adopt moderate sedation or above or general anesthesia. Among many sedatives such as dezocine, midazolam and other drugs, propofol has a good sedative effect in painless bronchoscopy diagnosis and treatment due to its fast onset and short half-life. However, while propofol provides sedation and analgesia to patients, it also exerts a certain degree of reversible inhibition on their cardiovascular and respiratory systems, making them prone to adverse events such as respiratory depression, tongue retraction,

and hypoxia. In severe cases, respiratory tract obstruction and apnea may occur. At the same time, since fiberoptic bronchoscopy and anesthesia share the airway to some extent, it also increases the difficulty of airway management. Therefore, preventing the occurrence of hypoxemia is an important job responsibility of anesthesiologists conducting bronchoscopy diagnosis and treatment, especially for high-risk groups of hypoxemia such as obesity and OSA. In a randomized controlled study on laryngeal masks for bronchoscopy, it was found that the incidence of pulse oxygen saturation SPO2 < 88% in 53 patients who received LM for bronchoscopy was significantly reduced (non-LM vs LM:) In bronchoscopy diagnosis and treatment, LM can establish good airway support and maintain the blood oxygen saturation of patients during the operation (63.4% vs 37%). Furthermore, a study by Regina on the application of LM in ultrasound bronchoscopy (EBUS) also verified that LM in bronchoscopy can provide continuous oxygenation support, and the number of cases and frequencies requiring airway intervention measures such as jaw support and increased oxygen flow during the operation are relatively low [11]. The SafeLM Video Laryngeal Mask can ensure that the laryngeal mask is placed in the correct anatomical position and is suitable for patients with difficult airways such as obesity and laryngeal stenosis. It guarantees that the laryngeal mask does not shift or leak air during bronchoscopy diagnosis and treatment, provides continuous oxygenation support during the diagnosis and treatment process, and avoids the occurrence of intraoperative hypoxemia. At the same time, the SafeLM Video Laryngeal Mask allows doctors to monitor the placement of the laryngeal mask in real time. To prevent the occurrence of laryngeal mask detachment and displacement due to endoscopist operation, provide good ventilation conditions during the operation, thereby effectively preventing the occurrence of intraoperative hypoxemia.

Ⅲ. Optimize interventional treatment and shorten the diagnosis and treatment time

Therapeutic bronchoscopy may include interventional treatment methods such as thermal ablation, frozen biopsy, and foreign body removal. Commonly used airway

management tools include single-lumen tracheal intubation or double-lumen tracheal intubation, laryngeal mask, etc. Compared with tracheal intubation, the SafeLM Video Laryngeal Mask has a larger inner diameter of the ventilation channel for therapeutic tracheoscopy, allowing larger diameter fiberoptic bronchoscopes to enter and exit. It also has low airway resistance, providing stable airway protection and reducing the risk of foreign body detachment or bleeding. At the same time, it can be adjusted in a timely manner under visual conditions to ensure the accurate position of the laryngeal mask and reduce the number of endoscopic operation interruptions. This will further shorten the operation time of endoscopic treatment. Manoj et al. found through a single-center retrospective study that compared with tracheal intubation, LM for bronchoscopic frozen biopsy can facilitate the entry of soft fibrous bronchi, maintain the intraoperative oxygenation index of patients, and provide sufficient airway support [12]. This research result verified the safety and efficacy of LM in bronchoscopic frozen biopsy. It can be an effective alternative airway tool to tracheal intubation during frozen biopsy. Meanwhile, using a laryngeal mask instead of tracheal intubation as the airway tool for frozen biopsy can also ensure the stability of hemodynamics during the operation, reduce the damage to airway mucosa caused by tracheal intubation, and lower the incidence of postoperative sore throat and cough. Improve the comfort of patients after diagnosis and treatment. In addition, the SafeLM Video Laryngeal Mask is used for interventional treatment. Under visual observation, the placement position of the laryngeal mask can be observed, ensuring a tight fit between the laryngeal mask and the laryngeal tissues. This reduces the risk of the laryngeal mask falling off and shifting due to endoscopic operations. Moreover, when the laryngeal mask shifts or leaks air, it can be adjusted as soon as possible under clear vision without the need for the endoscopist to remove the endoscope and stop the operation, thereby shortening the operation time and improving the turnover efficiency of the endoscopy room.

Conclusion

In recent years, with the advancement of comfortable medical care, painless

bronchoscopy has gradually replaced traditional bronchoscopy in interventional pulmonology, reducing patients' preoperative tension and anxiety. It has safely and smoothly completed endoscopic diagnosis and treatment operations at moderate and deep sedation levels, improving patients' satisfaction with endoscopists and reducing postoperative discomfort such as nausea and vomiting. The SafeLM Video Laryngeal Mask used in bronchoscopy diagnosis and treatment can observe the relative anatomical position of the laryngeal mask and the pharynx under visual conditions, improve the success rate of the first implantation, and at the same time reduce the injury of soft tissues in the pharynx such as the epiglottis and arytenoid cartilage, and lower the incidence of postoperative complications such as sore throat and cough. In addition, hypoxemia is also a common complication in painless bronchoscopy. Patients who develop hypoxemia during the operation need to discontinue the endoscopic procedure and adopt airway intervention methods such as mandibular support and mask oxygen supply. The SafeLM Video Laryngeal Mask is used in bronchoscopy to maintain the intraoperative oxygenation index of patients, reduce the occurrence of hypoxemia, and reduce the workload of anesthesiologists. Meanwhile, the SafeLM Video Laryngeal Mask used in therapeutic tracheoscopy does not interfere with the endoscopist's endoscopic operation, providing stable airway support. Moreover, the SafeLM Video Laryngeal Mask ensures a tight fit between the laryngeal mask and the throat, preventing it from falling off and leaking air due to the endoscopist's operation. It can also be quickly adjusted under visual conditions without the need to stop the endoscopic operation, shortening the operation time and improving the turnover efficiency of the endoscopy room which shows good clinical economic value.

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